PATENT
8733.395.00

UNITED STATES PATENT APPLICATION

OF

SUN-IM PARK

FOR

PACKING APPARATUS FOR LIQUID CRYSTAL DISPLAY MODULES

This application claims the benefit of Korean Patent Application No. 2000-7384, filed on February 16, 2000, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an apparatus for packing liquid crystal display modules.

Discussion of the Related Art

When packaging new liquid crystal display modules (LCMs) it is very important to protect each liquid crystal display module from damage that may occur during loading, charging, transporting, shipping, and the like.

As shown in Figure 1, a typical LCM 100 has first and second frames 2 and 4 that surround a liquid crystal panel (not shown) and a back-light device (not shown). The backlight device includes a lamp (not shown) in a lamp housing (also not shown). A lamp wire 6 that is used to connect the lamp to an exterior power source extends from the LCM. Depending on the particular model, the lamp wire 6 may exit the LCM at various positions. The liquid crystal panel (not shown) in the LCM 100 includes a plurality of switching devices and driving circuits for driving the switching devices. Since the switching devices and driving circuits are affected by static electricity and exterior impact, a special packing apparatus for LCMs has been developed to safely pack the LCMs.

Figure 2 is a perspective view illustrating a conventional packing apparatus 40 for packing typical LCMs 100. In FIG. 2, the packing apparatus 40 includes a packing frame

42 having a structure that includes a lower plate 42c. The lower plate 42c preferably comprises a substantially rectangular frame member with an open space defined at a central area. Side walls 42b and 42d attach at side edges of the lower plate 42c. Each of the side walls 42b and 42c includes a cover 42a that extends from the upper ends of the side walls 42b and 42d. The covers 42a can pivot over the top of the side walls and extend down inside of the packing apparatus. After liquid crystal display modules have been inserted into the packing apparatus 40 the covers 42a retain the LCM in the packaging assembly. A plurality of projections 44 are beneficially provided on the outer surface of the packing frame 42. Those projections are for absorbing external impacts applied to the packing apparatus 40.

Fixing jaws 46 are disposed on the inner surface of the side walls 42b and 42d. The fixing jaws receive and hold individual LCMs 100. The conventional packing apparatus 40 is preferably made from plastic, such as expanded polyethylene (EPE) or expanded polypropylene (EPP), using a metal mold. In operation, the lower plate 42c, side walls 42b and 42d, and upper covers 42a protect LCMs 100 from exterior impact.

The packing frame 42 preferably has slant surfaces at its edges or joints so that it can be easily folded. In other words, each of the edge portions or interconnected joints of the packing frame has a longitudinal section in the shape of a "V", and the side walls 42b and 42d are foldably connected to the lower plate 42c. Furthermore, the upper plates 42a are foldably connected to the respective side walls 42b and 42c. Thus, the packing apparatus 40 can easily be transformed from flat to the folded state shown in FIG. 2. Furthermore, the sum of the widths of the two covers 42a is beneficially equal to or less than the width of the packing frame 42.

The projections 44 spaced along the outer surfaces of the packing frame 42 serve to relieve and absorb exterior impacts applied to the apparatus 40. The projections 44 are beneficially positioned on each side of the outer surface of the packing frame 42 and have a cross-section in the shape of a letter "U".

The fixing jaws 46 are separated by a predetermined distance along each side wall 42b and 42d, and are opposed by other fixing jaws 46 on the opposite side wall. If the packing assembly 40 holds ten liquid crystal display modules, the inner surfaces of the side walls 42b and 42d are provided with eleven pairs of fixing jaws 46. The number of LCMs 100 to be accommodated in the packing assembly 40, and the required number of fixing jaws 46, can be varied as needed.

Each LCM 100 is placed in a shielding bag 10 before being inserted into the packing apparatus 40. The shielding bag protects the LCM from static electricity and from exterior impacts. The shielding bag 10 is made of polypropylene (PP), polyethylene (PE) or the like, and includes metallic material to protect the LCM from static electricity.

The packing apparatus 40 has a disadvantage in that the fixing jaws 46 hold only two sides of each LCM 100. Therefore, if a packing apparatus 40 holding LCMs 100 is dropped, or if the LCMs are stored for a long time, the LCMs 100 tend to become bent.

Furthermore, when the covers 42a are closed, they forcefully contact the shielding bag 10 containing the LCM 100 such that pressure is applied to the lamp wire 6. Therefore, if an LCM is stored in the packing apparatus 40 for a long time, a lamp wire 6 may be damaged by pressure applied by the covers 42a.

In addition, during packing or unpacking work, because both of the two upper substrates 42a must be closed or opened, work efficiency is poor.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a packing apparatus for liquid crystal display modules, which substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a packing apparatus that minimizes bending of LCMs from dropping or storing.

Another object of the present invention is to provide a packing apparatus that reduces damage to a lamp wire of an LCMs.

Another object of the present invention is to provide a packing apparatus that improves the efficiency of packing or unpacking.

Additional features and advantages of the invention will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

An embodiment of the present invention provides a liquid crystal display module packing apparatus. That apparatus includes a rectangular lower plate, first and second side walls that extend from respective sides of the lower plate, and an upper plate that extends from an upper edge of the first side wall to an upper edge of the second side wall. The apparatus further includes a plurality of auxiliary side walls, some extend from the ends of the first and second side walls, and others extend from the middle of the first and second side walls. Additionally, a plurality of fixing jaws are located on inner surfaces of the lower plate,

of the first and second side walls, and of the upper plate. Adjacent fixing jaws on the same surface are spaced apart with a gap that corresponds to the thickness of a liquid crystal display module. Opposed fixing jaws act to receive and retain inserted LCMs.

A plurality of projections are provided on outer surfaces of the apparatus to relieve exterior impacts. Each projection preferably has an alternating stepped shape.

A plurality of grooves are beneficially disposed at side edges of the upper plate. The grooves receive the lamp wires of the liquid crystal display module. Additional grooves can be disposed at the upper edges of the first and second side walls. Again, the grooves are to receive the lamp wires.

The packing apparatus is beneficially made from resin.

The side plates are beneficially foldably connected to the lower plate. The upper plate is beneficially foldably connected to the first side wall. The upper plate is beneficially foldably connected to the second side wall.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate features of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

FIG. 1 is a perspective view showing a LCM;

FIG. 2 is a perspective view showing a prior art packing apparatus for LCMs;

FIG. 3 is perspective view showing a packing apparatus for LCMs that is in accord with the principles of the present invention; and

FIG. 4 is a diagram showing a side view of the packing apparatus of FIG. 3 when it is unfolded.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Reference will now be made in detail to an illustrated embodiment of the present invention, an example of which is illustrated in the accompanying drawings.

FIG. 3 is a perspective view of a packing apparatus 300 according to the principles of the present invention. In practice, a LCM 100 is placed into a shielding bag 10 before being inserted into the packing apparatus 300. The shielding bag protects the LCM 100 from static electricity and exterior impact. The shielding bag 10 is preferably made of polypropylene (PP), polyethylene (PE) or the like, and includes metallic material to reduce the impact of static electricity.

The packing apparatus 300 includes a lower plate 310, first and second side walls 320a and 320b, and an upper plate 340. The lower plate 310 preferably includes a plurality of centrally located first fixing jaws 312. The first and second side walls 320a and 320b extend from, but are connected to, the sides of the lower plate 310. The upper plate 340 extends from, but is connected to, the second side wall 320b. The upper plate 340 can be folded onto the first side wall 320a to retain LCMs 100 that have been inserted into the

packing apparatus 300. A plurality of projections 328 are beneficially provided on the outer surfaces of the packing apparatus 300. Those projections absorb exterior impacts.

The first and second side walls 320a and 320b include first and second auxiliary side walls 322a and 322b at their ends, and preferably a third auxiliary side wall 322c at their middle. The first, second, and third auxiliary side walls 322a, 322b, and 322c extend perpendicularly from their corresponding side walls 320a and 320b. The auxiliary side walls 322a, 322b, and 322c reduce deformation of the side walls 320a and 320b when a normal impact is applied.

The first fixing jaws 312 of the lower plate 310 receive and retain LCMs 100. Second fixing jaws 326 that are similar to the first fixing jaws 312 are disposed on the inner surface of the first and second side walls 320a and 320b. Again, those jaws receive and retain LCMs 100. In addition, third fixing jaws 342 are disposed on the inner surface of the upper plate 340. Once again, those jaws receive and retain LCMs 100. Therefore, when an LCM 100 is placed into the packing apparatus 300 and the upper plate 340 is folded into position, the LCM 100 is held by corresponding first, second, and third fixing jaws 312, 326, and 342. The lower plate 310, first and second side walls 320a and 320b, and the upper plate 340 protect the held LCM 100.

The packing apparatus 300 is beneficially fabricated from a resin, such as expanded polyethylene (EPE) or expanded polypropylene (EPP), using a metal mold.

The packing apparatus 300 preferably has slant surfaces so that it can be easily folded. In other words, each edge or interconnected joint has a longitudinal section in the shape of a "V" such that the first and second side walls 320a and 320b are foldably connected to the lower plate 310, and the upper plate 340 is foldably connected to the second side wall

320b. Thus, the apparatus can easily be transformed to the flat, unfolded state of Figure 4 from the folded state shown in FIG. 3. Further, the upper plate 340 has a width that is less than or equal to the width of the folded packing apparatus 300.

In addition, grooves 330 are formed at each side edge of the upper plate 340 and at the upper edges of the first and second side walls 320a and 320b. The grooves 330 are designed to receive lamp wires 6 when LCMs 100 are placed into the packing apparatus 300. Thus, the grooves 330 prevent forceful contact between the upper plate 340 and the lamp wires 6.

The projections 328, which are preferably formed by protruding members on outer surfaces of the packing apparatus 300, serve to relieve and absorb exterior impacts on the packing apparatus 300. Each projection 328 preferably has an alternating stepped shape, forming a sequence of concave and convex structures.

The first, second, and third fixing jaws 312, 326, and 342 are spaced apart from each other by a predetermined distance and are aligned with fixing jaws on the other inner surfaces. The number of LCMs 100 able to be accommodated in the packing apparatus 300 and the corresponding number of fixing jaws 312, 326, and 342 can be varied as needed.

As shown in Figure 4, the upper plate 340, the second side wall 320b, the lower substrate 310, and the first side wall 320a are sequentially connected together. Further, each connected edge portion has a "V" shape, which enables efficient folding of the packing apparatus 300 into the shape shown in Figure 3.

It will be apparent to those skilled in the art that various modifications and variation can be made to the illustrated embodiment without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers the

modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.